Non-Nuclear Strategies for Deflecting Comets and Asteroids

H.J. Melosh
Lunar and Planetary Laboratory
University of Arizona
Tucson, Arizona

A number of authors have recently suggested that the only plausible defense against large Earth-threatening comets or asteroids is the use of very large (Gigaton) nuclear weapons. However, it can be plausibly argued that the mere existence of an arsenal of such weapons constitutes a danger to humanity far greater than the threat they are intended to mitigate. We have investigated other means of deflecting threatening asteroids. In particular, we have found a new solar collector strategy in which silicate and ice vapor from a heated spot on an asteroid or comet can provide sufficient thrust to deflect even a 10 km diameter asteroid with 10 years advance warning using a 1.5 km diameter collecting surface. Although this concept requires further technical development and suffers from at least one important problem (protecting the solar collector from the mass of gas and dust blown off the asteroid), initial order of magnitude estimates suggest that it could out-perform nuclear wepaons on a per-unit-weight basis. More importantly, the solar collector is big, fragile and slow, making it difficult to misuse this technology as a weapon of mass destruction.